NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS SOIL DESCRIPTION TERMS AND DEFINITIONS HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED <u>WELL GRADED</u>- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.(ALSO SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER. ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD TIELD ST REFUSAL.

SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE
OF MATERIAL PROPERTY OF THE PR WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 180 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASTID T208, ASTID 1-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: AQUIFER - A WATER BEARING FORMATION OR STRATA. SAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ANGULARITY OF GRAINS CONSISTENCY, COLOR, TEXTURE, MOISTURE, AGSHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS: RGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, THE ANGULARITY OR ROUNDNESS OF 901L GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR, WEATHERED ROCK (WR) R HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS VERY STIFF, GRAY SILTY CLAY, WOIST WITH INTERBEDDED FINE SAND LIVERS, HIGHLY PLASTIC, A-7-6 SUBANGULAR, SUBROUNDED, OR ROUNDED. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL PER FOOT. MINERALOGICAL COMPOSITION SOIL LEGEND AND AASHTO CLASSIFICATION S IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT CRYSTALLINE ROCK (CR) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. GROUND SURFACE. GENERA MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS ORGANIC MATERIALS (\$5% PASSING #200) WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. (>85% PASSING *200) CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. CLASS. FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAT COMPRESSIBILITY A-1 A-3 A-4 A-5 A-6 A-7 NON-CRYSTALLINE ROCK (NCR) A-2 A-1, A-2 <u>COLLUVIUM</u> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE A-3 A-6, A-7 INCLUDES PHYLLITE, SLATE, SANOSTONE, ETC.

COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD CLASS. A-1-- A-1-h A-2-4 A-2-5 A-2-6 A-2-7 LIQUID LIMIT LESS THAN 30 DASTAL PLAIN EDIMENTARY ROCK MODERATELY COMPRESSIBLE CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. LIQUID LIMIT 31-50 LIQUID LIMIT GREATER THAN 50 SYMBOL HIGHLY COMPRESSIBLE SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC PASSING PERCENTAGE OF MATERIAL WEATHERING DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT RANULA GRANULAR SILT- CLAY ROCKS OR CUTS MASSIVE ROCK. CLAY ORGANIC MATERIAL OTHER MATERIAL BO MXTO MXTO M PFAT SOILS SOILS ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER FRESH DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE RACE OF ORGANIC MATTER TRACE 5 MX|35 MX|35 MX|35 MX|36 MN|36 MN|36 MN|36 I 2 - 3% 3 - 5% 1 - 10% HAMMER IF CRYSTALLINE. LITTLE ORGANIC MATTER 5 - 12% LITTLE 10 - 20% LIQUID LIMIT a mx41 mn laa mx41 mn laa mx41 mn laa mx41 m VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, 12 - 20% DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF SOILS WITH SOME 20 - 352 PLASTIC INDEX N.P. 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF (V. SL1.) LITTLE OR HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH OF A CRYSTALLINE NATURE. MODERATE GROUP INDEX 0 0 0 4 MX | 8 MX | 12 MX | 16 MX | No M GROUND WATER FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE AMOUNTS OF SI TOUT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLOBATION EXTENDS INTO BOCK UP TO USUAL TYPES STONE FRAGS. FINE SOILS SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. SILTY OR CLAYEY SILTY CLAYEY WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING (SLI.) GRAVEL AND FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. GRAVEL AND SAND SOILS MATTER **W**___ STATIC WATER LEVEL AFTER 24 HOURS MATERIALS SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN MODERATE LOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED VPW. (MOD.) PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA PARENT MATERIAL. EXCELLENT TO GOOD POOR FAIR TO POOR AS A NSUITABL POOR FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. RIBGRADE OM-WITH FRESH ROCK. SPRING OR SEEPAGE P.I. OF A-7-5 ≤ L.L. - 30 : P.I. OF A-7-6 > L.L. - 30 MODERATELY ALL BOCK EXCEPT DUARTZ DISCOLORED OR STAINED. IN GRANITOID BOCKS, ALL FELDSPARS DULL MISCELLANEOUS SYMBOLS AND DISCOLORED AND A MAJORITY SHOW KADLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK. CONSISTENCY OR DENSENESS FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN RANGE OF UNCONFINED RANGE OF STANDARI (MOD, SEV.) COMPACTNESS OR COMPRESSIVE STRENGTH (TONS/FT2) DPT DHT TEST BORING PRIMARY SOUL TYPE PENETRATION RESISTENCE IF TESTED, WOULD YIELD SPT REFUSAL JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. WITH SOIL DESCRIPTION (N-VALUE) DESIGNATIONS ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCE! SEVERE LEDGE - A SHELF-LIKE RIDGE OF PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. \oplus IN STRENGTH TO STRONG SDIL, IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME AUGER BORING GENERALLY S- BULK SAMPLE LOOSE 4 TO 10 EXTENT, SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN GRANULAF MEDIUM DENSE N/A LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. 10 TO 30 ARTIFICIAL FILL OTHER THAN SS- SPLIT SPOON SAMPLE IF TESTED, YIELDS SPT N VALUES > 100 BPF MATERIAL (NON-COHESIVE) CORE BORING DENSE 30 TO 50 ROADWAY EMBANKMENTS MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC FLEMENTS ARE DISCERNIBLE BUT VERY DENSE SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. ST- SHELBY TUBE THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK VERY SOF PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN O REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR (0.25 MONITORING WELL SOFT 2 TO 4 VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF NTERVENING IMPERVIOUS STRATUM. GENERALLY 0.25 TO 0.5 SUFERIED ROCK LINE RS- ROCK SAMPLE MEDIUM STIFF 4 TO 8 PIEZOMETER Ø.5 TO 1 ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. INSTALLATION MATERIAL STIFF 8 TO 15 ALLUVIAL SOIL BOUNDARY RT- RECOMPACTED SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS VERY STIFF ROCK QUALITY DESIGNATION (R.O.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND 15 TO 30 COHESIVE TRIAXIAL SAMPLE SLOPE INDICATOR HARD \bigcirc DIP/DIP DIRECTION OF INSTALLATION CBR - CBR SAMPLE ROCK HARDNESS ROCK STRUCTURES TEXTURE OR GRAIN SIZE SPT N-VALUE SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES VERY HARD a - SOUNDING ROD REF- SPT REFUSAL J.S. STD. SIEVE SIZE SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED ABBREVIATIONS COARSE FINE TO DETACH HAND SPECIMEN. CORR! F GRAVE SHIT CLAY (CL.) AR - AUGER REFUSAL PMT - PRESSUREMETER TEST (COB.) MODERATELY CAN BE SCRATCHED BY KNIFF OR PICK, GOLIGES OR GROOVES TO 0.25 INCHES DEEP CAN BE (BLDR.) (GR.) (SL.) SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR - BORING TERMINATED EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED CL. - CLAY SL. - SILT. SILTY MM 305 75 2.0 0.25 0.05 0.005 BY MODERATE BLOWS. CPT - CONE PENETRATION TEST CSE. - COARSE SLT. - SLIGHTLY STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) OF SIZE IN. 12 CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. MEDIUM TRICONE REFUSAL 9 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE JRE - CORRELATION OF TERMS DMT - DILATOMETER TEST SOIL MOI γ - UNIT WEIGHT POINT OF A GEOLOGISTS PICK. DPT - DYNAMIC PENETRATION TEST SOTI MOISTURE SCALE WITH 60 BLOWS. 7d - DRY UNIT WEIGHT GUIDE FOR FIELD MOISTURE DESCRIPTION CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS SOFT VOID RATIO (ATTERBERG LIMITS) STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. F. - FINE W - MOISTURE CONTENT FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT, SMALL THIN FOSS. - FOSSILIFEROUS PIECES CAN BE BROKEN BY FINGER PRESSURE. - SATURATED JSUALLY LIQUID: VERY WET, USUALL VST - VANE SHEAR TEST STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: FRAC. - FRACTURED CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH FROM BELOW THE GROUND WATER TABLE (SAT.) TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. FRAGS. - FRAGMENTS LIQUID LIMIT SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY MED. - MEDIUM SEMISOLID; REQUIRES DRYING TO TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER RANGE - WFT - (W) EQUIPMENT USED ON SUBJECT PROJECT FRACTURE SPACING ATTAIN OPTIMUM MOISTURE PLASTIC LIMIT TERM THICKNESS TERM SPACING BENCH MARK: #2 BASELINE STA. 12+68.19, 105.98' LT- SPIKE IN HAMMER TYPE: DRILL UNITS: VERY THICKLY BEDDED > 4 FEET VERY WIDE MORE THAN 10 FEET BASE OF 20" LOCUST SOLID: AT OR NEAR OPTIMUM MOISTURE AUTOMATIC MANUAL - MOIST - (M) OPTIMUM MOISTURE THICKLY BEDDED 1.5 - 4 FEET WIDE 3 TO 10 FEET CLAY BITS ELEVATION: 747.50' MOBILE B-THINLY BEDDED SHRINKAGE LIMIT MODERATELY CLOSE 1 TO 3 FEET VERY THINLY REDDED 0.03 - 0.16 FFFT 6 CONTINUOUS FLIGHT AUGER CORE SIZE: 0.16 TO 1 FEET REQUIRES ADDITIONAL WATER TO CLOSE NOTES: THICKLY LAMINATED - DRY - (D) BK-51 LESS THAN 0.16 FEET ATTAIN OPTIMUM MOISTURE 8" HOLLOW AUGERS -B____ THINLY LAMINATED < 0.008 FEET INDURATION HARD FACED FINGER BITS CME-45C N XWL FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. PLASTICITY INDEX (PI DRY STRENGTH TUNG.-CARBIDE INSERTS ___-H___ RUBBING WITH FINGER FREES NUMEROUS GRAINS; VERY LOW NONPLASTIC 0-5 FRIABLE CASING W/ ADVANCER OW PLASTICITY 6-15 SLIGHT GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. HAND TOOLS: MED. PLASTICITY 16-25 PORTABLE HOIST TRICONE_ *STEEL TEETH POST HOLE DIGGER MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE: HIGH PLASTICITY 26 OR MORE HIGH BREAKS EASILY WHEN HIT WITH HAMMER, \Box TRICONE HAND AUGER OTHER GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; SOUNDING ROD INDURATED CORE BIT DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN. RED. YEL-BRN. BLUE-GRAY) DIFFICULT TO BREAK WITH HAMMER. VANE SHEAR TEST OTHER_ MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. OTHER_ SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; EXTREMELY INDURATED OTHER SAMPLE BREAKS ACROSS GRAINS.

STATE PROJECT NO. ISHEET NO. ITOTAL SHEETS

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